opposite is the case. Klein's spring is specifically disclosed to be "lightly biased", sufficient to function as a check valve in the condition of no flow but otherwise to be so weakly biased as to bottom out in all conditions of relevant flow. Put otherwise, **if** Klein's spring maintained **any** intermediate position during relevant flow (i.e. if it were **not** bottomed out on its preselected stop but maintained in an indeterminate position to secure a predetermined pressure drop) **then**, the situation would be the same as if Klein's device **had** "bottomed out" at a **different** stop position. In **that** case, (i.e. effectively "bottoming out" or resting on other than the stop position preselected by the operator) Klein's valve would be **mal**functioning. It would not be working for its intended purpose. It would, in effect, be "bottomed out" on a different stop position (other than that selected by the operator.) Klein's valve is only disclosed to properly meter for the preselected product ratio when the piston bottoms out on the correct, preselected, stop position.

Distinction between Klein's Disclosure and the Independent Claims

Specifically in regard to the claims, the primary issue is whether Klein discloses:

"adjusting a fire fighting fluid orifice in a fire fighting fluid conduit **to maintain a predetermined pressure drop across the orifice as fire fighting fluid flow rate through the conduit varies"** – claim 12;

"varying a fire fighting fluid orifice in a conduit **to maintain a preselected pressure drop in the conduit and wherein the varying fire fighting fluid orifice acts as a fire fighting fluid flow rate indicator"** – claim 14;

"automatically adjusting a fire fighting nozzle **to control discharge pressure"** – claim 20;

"automatically varying a foam proportioning orifice in order to meter foam concentrate self-educted into the nozzle **in accordance with fire fighting fluid flow rate through the nozzle"** – claim 20;

"varying the obstruction by the pilot valve **to maintain a fixed pressure drop in the fire fighting fluid conduit"** – claim 39;

"automatically adjusting an obstruction in a fire fighting fluid conduit flowing at least 500 gpm **to maintain a preselected pressure drop"** – claim 42.

Discussion

The only place where the examiner addresses the portions in bold above regarding maintaining a predetermined or preselected or fixed pressure drop is in paragraph 5 of the Action. There the examiner asserts, in response to the applicant's position that a "preselected pressure drop" or a "predetermined pressure drop" is **not** disclosed by Klein: "the device of Klein inherently has predetermined and preselected functional parameters [it must be assumed here that "pressure drop" is to be one of them] which are determined by, for example, flow path size, flow path shape, valve shape, valve size, and spring constant."

The examiner may be asserting that corresponding to each stop position in Klein's device, given the device's structure, is an inherent "pressure drop." This assertion, if it is being made, requires substantiation, since one would assume, for example, that as supply pressure to Klein's device is raised, discharge pressure would rise proportionately.

<u>Re primary reference Klein.</u> Assuming the straightforward meaning of "preselected"_and/or "predetermined", Klein neither teaches not suggests maintaining a targeted pressure drop of the primary fluid across his orifice. Such is not inherent in Klein and is incompatible with his invention. His invention requires the piston to move to a full open or bottomed out position in order to perform its metering function for different concentrate ratios, as dictated by different concentrate products. "The piston return spring 38 is a sufficiently weak spring so that with any amount of pump flow the displacement limiting pin 62 will always bottom out … ." Col. 7, lines 10 – 14.

To the contrary of teaching maintaining a targeted pressure drop, Klein teaches using his displaceable piston, which is only "lightly biased" by a spring towards the closed position, to open to an amount (fixed by a stop) which determines the ratio of the proportioning (e.g. 3%, 6% or 10%.) The opening of his piston does not determine or target any pressure drop across the ofifice. To summarize, a small fluid pressure overcomes the lightly biased-closed position of Klein's piston and moves the piston to its full open and stopped position (the full open position being preselectable, to accomplish Klein's ratioing purpose.)

"[T]he piston is lightly biased by a spring toward the upstream direction to a closed unactuated position of the valve … . Mainstream fluid flow through the valve body shifts the piston to a preselected actuated position wherein the piston is stopped … . The stop position of the piston is determined by the position of an adjustable stop member… , the stop member being adjustable to any one of a plurality of specific stop positions which cause the piston to stop at respective discrete predetermined positions." Klein, col. 2, line 66 – col. 3, line 18

The point or purpose of Klein's mixing valve is to meter different concentrate products that require or call for different proportions or ratios. That ratio is preset by Klein's stops. Those of skill in the art would further understand that Kllein has disclosed essentially a fixed flow device, a device having a fixed discharge outlet. Output pressure with a fixed discharge orificetends to vary rather than output fluid flow.

Note that Klein teaches deploying his mixing valve preferably on the suction side of a pump but it also may be deployed on the pressure side of the pump. Col 7, lines 5 – 8. When a valve is to be deployed adjacent a pump, the pump would be relied on to set flow pressures. There would be no need for an "automatic" feature in Klein's device.

Klein also neither teaches nor suggests a constant pressure drop concept in his valve to increase efficiency. Trying to implement such with his piston would destroy the functionality of his piston for his invention. On col. 7, lines 19 – 21, Klein makes clear that the degree of piston displacement corresponds to the ratio selected, i.e. 3%, 6%, 10% or the like. The piston bottoms out on the stop that has been preselected for that ratio. Thus, the piston can not be used to create a preselected constant pressure drop.

As summarized and evidenced above, it is clear from Klein that his device functions for its intended purpose only when the orifice is adjusted to bottom out on the preselected stop. The preselected stop does not maintain a constant pressure drop across any orifice but rather a preselected ratio for product to water metered in.

Also Klein's device has a fixed discharge outlet. Thus, it is analogous to a fixed flow type of nozzle, as discussed in the specification on page . It is an automatic pressure regulating type of nozzle having a variable discharge outlet, that gives importance to the instant invention.

The examiner's statement in paragraph 5 is incorrect. Applicant claims "adjusting X to maintain a predetermined pressure drop as Z varies." Klein adjusts X, (to achieve a predetermined product-to-water ratio, which is different from pressure drop.) The only way to construe Klein is as teaching adjusting X "to maintain a predetermined product-to-water ratio as Z varies" and accepting whatever pressure drop happens to result from the adjustment of X, (given the variance of Z and all other factors, including such factors as variance of upstream pressure and variance of downstream outlets open, factors way beyond the design structure of Klein's device.) (See specification, page 24 , lines 20 - 22.)

For applicant, a preselected or predetermined pressure drop is a targeted pressure drop across the orifice, a pressure drop to be maintained by the adjusting. For instance, if the orifice is a nozzle discharge, the predetermined pressure drop would be a targeted discharge pressure, such as 100 psi, or 120 psi (those of skill in the art readily understanding that the "drop" is to atmospheric.) See specification page 2. If the orifice is in-line in a conduit, the preselected pressure drop might be 15 or 20 psi, for efficiency of operation. See specification page 24.

The examiner argues that the device of Klein inherently has predetermined and preselected functional patameters which are determined by, for example, flow path size, flow path shape, valve shape, valve size , and spring constant." If we assume the examiner is saying that the device of Klein inherently has a predetermined and preselected "pressure drop" across the orifice as determined by the structural features of the Klein device, we disagree. **Given** the structural dimensions of the Klein device, the resulting pressure drop **still** is a function of upstream head pressure and number of devices open downstream, to name two prominent factors. Klein's structural design per se does not inherently predetermine any "pressure drop" if and when those two factors vary.

<u>Re the differences between Klein and the instant claims</u>. All claims recite maintaining a predetermined (or preselected or fixed) pressure drop across a primary fluid orifice, or controlling discharge pressure. Klein neither teaches nor suggests such. Such is not inherent with Klein. Klein is incompatible with such.

It is respectfully submitted that all independent claims, reciting maintaining a predetermined or preselected or fixed pressure drop, or controlling discharge pressure by automatically controlling a nozzle, are allowable. All independent claims being allowable for that reason, there is no need to further argue the independent or dependent claims.

However, applicant points out that using the device of Klein as a nozzle (re claims 20 and 42) would create a "fixed flow" nozzle, not an "automatic" nozzle, as would be clear to any one of ordinary skill in the art. See specification page for discussion of difference. Klein neither teaches nor suggests automatically adjusting a nozzle to control discharge pressure. It would be clear to one of skill in the art that Klein's valve 36, spring 38 and orifice 54 do not and could not, automatically control a nozzle to control discharge pressure. Klein never discloses that they do, expressly or implicitly.

In applicant's invention there is a direct correlation between the variance of the fire fighting fluid orifice and the fire fighting fluid flow rate. In Klein's device there is no such correlation. Klein's piston bottoms out at the stop preselected to correspond to the additive product being used. Thus, Klein's variable orifice has nothing to do, no correlation, with fire fighting fluid flow rate. The fixed orifice at the downstream end of Klein's device does affect flow rate, tending to create a "fixed flow" device. Thus, as per claim 14, Klein does not teach or suggest, and in fact teaches away from, varying an orifice with it acting as a flow rate indicator.

Klein teaches varying a foam proportioning orifice in accordance with a preset stop, not in accordance with flow rate through the nozzle. Klein neither teaches nor suggests this aspect of claim 20.

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Sue Z. Shaper, Applicants' Attorney at 713 550 5710 so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

7/8/13
Date

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Substitute Claims for RCE Response – Mark Up

12. A method for proportioning a fire fighting chemical into variably flowing fire fighting fluid , comprising:

adjusting a fire fighting fluid orifice in a fire fighting fluid conduit to maintain a predetermined pressure drop across the orifice as fire fighting fluid flow rate through the conduit varies;

varying a fire fighting foam concentrate orifice in concert with the adjustment of the fire fighting fluid orifice; and

supplying fire fighting foam concentrate through the concentrate orifice into the fire fighting fluid proximate a pressure drop such that a ratio of the foam concentrate proportioned into the fire fighting fluid flowing through the conduit, to the fluid, remains approximately constant.

13. The method of claim 14 wherein varying a fire fighting fluid orifice includes adjusting a lateral movement of a baffle within the conduit

14. A method for automatically proportioning foam into variably flowing fire fighting fluid, comprising:

varying a fire fighting fluid orifice in a conduit to maintain a preselected pressure drop in the conduit and wherein the varying fire fighting fluid orifice acts as a fire fighting fluid flow rate indicator;

varying a foam concentrate orifice, at a rate calibrated in concert with variations of the fire fighting fluid orifice; and

discharging foam concentrate through the variable foam concentrate orifice proximate a low pressure zone created by a pressure drop at an approximately constant ratio to the fluid.

15. The method of claim 14 that includes varying the fire fighting fluid orifice based upon a spring resisting fire fighting fluid pressure in the conduit.

16. The method of claim 14 wherein varying the fire fighting fluid orifice includes setting a pilot valve to maintain [one or more pre-selected] a fixed pressure drop[s] across the orifice from among a range of preselectable fixed pressure drops.

17. The method of claim 16 wherein the pilot valve is biased by spring.

18. The method of claim 14 wherein varying a fire fighting fluid orifice includes adjusting a lateral movement of a piston within the conduit.

20. A method comprising:

automatically adjusting a fire fighting nozzle to controldischarge pressure;

self-educting fire fighting foam concentrate into the nozzle using a portion of a fire fighting fluid flowing at at least 500 gpm through the nozzle; and

automatically varying a foam proportioning orifice in order to meter foam concentrate self-educted into the nozzle in accordance with fire fighting flüid flow rate through the nozzle

39. Method for proportioning foam concentrate into a variable flow fire fighting fluid conduit, comprising:

placing pressurized foam concentrate in communication with pressurized fire fighting fluid variably flowing through a conduit;

arranging a pilot valve sensitive to flow rate of the fire fighting fluid in the conduit;

adapting the pilot valve to adjust a flow rate of foam concentrate into the fire fighting fluid such that the foam concentrate is proportionally metered into the variably flowing fire fighting fluid;

adapting the pilot valve to vary an obstruction to flow of fire fighting fluid in the conduit; and

varying the obstruction by the pilot valve to maintain a fixed pressure drop in the fire fighting fluid conduit.

41. The method of claim 39 that includes measuring pressure drop around the obstruction.

42. A method comprising:

automatically adjusting an obstruction in a fire fighting fluid conduit flowing at least 500 gpm to maintain a preselected pressure drop;

arranging a pilot valve sensitive to fire fighting fluid flow rate in the conduit; and

proportionally metering, using the pilot valve, a foam concentrate into the conduit proximate the pressure drop.

43. The method of claim 39 that includes adjusting a flow rate of foam concentrate by adjusting an orifice in a foam concentrate flow conduit.

Substitute Claims for RCE Response

12. A method for proportioning a fire fighting chemical into variably flowing fire fighting fluid , comprising:

adjusting a fire fighting fluid orifice in a fire fighting fluid conduit to maintain a predetermined pressure drop across the orifice as fire fighting fluid flow rate through the conduit varies;

varying a fire fighting foam concentrate orifice in concert with the adjustment of the fire fighting fluid orifice; and

supplying fire fighting foam concentrate through the concentrate orifice into the fire fighting fluid proximate a pressure drop such that a ratio of the foam concentrate proportioned into the fire fighting fluid flowing through the conduit, to the fluid, remains approximately constant.

13. The method of claim 14 wherein varying a fire fighting fluid orifice includes adjusting a lateral movement of a baffle within the conduit

14. A method for automatically proportioning foam into variably flowing fire fighting fluid, comprising:

varying a fire fighting fluid orifice in a conduit to maintain a preselected pressure drop in the conduit and wherein the varying fire fighting fluid orifice acts as a fire fighting fluid flow rate indicator;

varying a foam concentrate orifice, at a rate calibrated in concert with variations of the fire fighting fluid orifice; and

discharging foam concentrate through the variable foam concentrate orifice proximate a low pressure zone created by a pressure drop at an approximately constant ratio to the fluid.

15. The method of claim 14 that includes varying the fire fighting fluid orifice based upon a spring resisting fire fighting fluid pressure in the conduit.

16. The method of claim 14 wherein varying the fire fighting fluid orifice includes setting a pilot valve to maintain a fixed pressure drop across the orifice from among a range of preselectable fixed pressure drops.

17. The method of claim 16 wherein the pilot valve is biased by spring.

18. The method of claim 14 wherein varying a fire fighting fluid orifice includes adjusting a lateral movement of a piston within the conduit.

20. A method comprising:

automatically adjusting a fire fighting nozzle to control discharge pressure;

self-educting fire fighting foam concentrate into the nozzle using a portion of a fire fighting fluid flowing at at least 500 gpm through the nozzle; and

automatically varying a foam proportioning orifice in order to meter foam concentrate self-educted into the nozzle in accordance with fire fighting fluid flow rate through the nozzle

39. Method for proportioning foam concentrate into a variable flow fire fighting fluid conduit, comprising:

placing pressurized foam concentrate in communication with pressurized fire fighting fluid variably flowing through a conduit;

arranging a pilot valve sensitive to flow rate of the fire fighting fluid in the conduit;

adapting the pilot valve to adjust a flow rate of foam concentrate into the fire fighting fluid such that the foam concentrate is proportionally metered into the variably flowing fire fighting fluid;

adapting the pilot valve to vary an obstruction to flow of fire fighting fluid in the conduit; and

varying the obstruction by the pilot valve to maintain a fixed pressure drop in the fire fighting fluid conduit.

41. The method of claim 39 that includes measuring pressure drop around the obstruction.

42. A method comprising:

automatically adjusting an obstruction in a fire fighting fluid conduit flowing at least 500 gpm to maintain a preselected pressure drop;

arranging a pilot valve sensitive to fire fighting fluid flow rate in the conduit; and

proportionally metering, using the pilot valve, a foam concentrate into the conduit proximate the pressure drop.

43. The method of claim 39 that includes adjusting a flow rate of foam concentrate by adjusting an orifice in a foam concentrate flow conduit.